



POLICY Brief

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Can Tax Combat Pollution? – An Assessment of the Sri Lankan Rubber Industry

Rubber processing in Sri Lanka is one of the most polluting industrial activities in the country, and, the current 'command and control' system of pollution control is proving to be ineffective. Now, a new SANDEE research suggests that taxation could be used to encourage the industry to clean up its act.

The SANDEE study recommends that the government should levy a tax equivalent to 8.6 per cent of the total annual turnover of the rubber industry. It argues that this would provide an incentive for the rubber industry to meet environmental standards. Such an economic instrument would also motivate the Sri Lankan Central Environmental Authority to monitor effluents more carefully, and that would give polluting firms an incentive to find innovative ways of dealing with their waste, such as recycling the chemicals in their effluents.

THE RUBBER POLLUTION CRISIS

Jagath Edirisinghe from the Wayamba University of Sri Lanka and Susantha Siriwardana, Sarath Siriwardana and Punsara Prasandith from the Rubber Research Institute of Sri Lanka, carried out the study. Most firms that process rubber in Sri Lanka do not currently comply with national water pollution control standards and more than half the estates that process rubber release effluents directly into natural water courses. This has serious environmental and social impacts, as water contaminated by rubber effluent is poisonous to wildlife and cannot be used for any other domestic or industrial purposes (see side bar for more on rubber processing and pollution).

The present system of pollution controls in Sri Lanka takes a command and control approach. Under this approach strict environmental standards are set and monitored by Sri Lanka's Central Environmental Authority (CEA). The CEA has identified the rubber industry as a significant polluter and has moved to force the sector to improve its environmental performance by ordering firms to urgently tackle their pollution. However, this approach is not working and enforcement is clearly lax because there is considerable evidence that the rubber industry is continuing to pollute.

THE RUBBER INDUSTRY AND WATER POLLUTION

Ninety percent of the rubber grown in Sri Lanka is in three districts – Kalutara, Kegalle and Ratnapura. Natural rubber production in 2006 was 114,700 MT, an increase of 9 per cent over the previous year.

A given volume of rubber latex contains only 30-40 per cent of rubber, and the balance is serum substances. The serum is a clear yellowish liquid containing amino acids, carbohydrates and plant growth substances along with lactic acid. In addition there are substances added to the latex such as sodium sulphite, ammonia or formalin. Formic, acetic, oxalic acid or a combination of these is also added to coagulate the latex. Other substances such as sodium bisulphite, metabisulphite or xylyl mercaptan are used to improve the quality of rubber. The serum and residues of the other chemicals are drained out of the factory as effluent, which is full of environmental pollutants.

This policy brief is based on SANDEE working paper No. 30 -08 'Taxing Pollution: A Case for Reducing the Environmental Impacts of Rubber Production in Sri Lanka', by Jagath Edirisinghe, Susantha Siriwardana, Sarath Siriwardana and Punsara Prasandith; c/o: the Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka; and the Department of Raw Rubber Process Development and Chemical Engineering, Rubber Research Institute of Sri Lanka. The full report is available at www.sandeeonline.org



An average-sized rubber factory, which normally produces crepe rubber, produces 1.5-2 metric tonnes (MT) of raw rubber and discharges 40-50 liters of effluent for every kilogram of rubber produced. Thus, during 2006, the industry is expected to have discharged 4.5 to 5.7 billion liters of effluent. Often, the effluent water is untreated and discharged into streams, making them unsuitable for human consumption. Chemical Oxygen Demand (COD) levels of more than 500mg/l are reported in waters where effluent is discharged (the maximum tolerance limit set by CEA for COD is 400 mg/l). Such pollution levels are found up to a kilometer away from a polluting factory.

HOW BEST TO CONTROL POLLUTION?

In recent years many studies have shown that market-based mechanisms, such as taxes, are better than command and control strategies as a way of cutting industrial pollution. The underlying idea of such an approach is that firms decrease their pollution so that they can reduce their tax burden. Any such tax must be pitched at the right level so that it makes economic sense for companies to act in the interests of the environment – in other words it must be cheaper to clean up than to pay the tax.

With these studies in mind, the research team set out to calculate what level of pollution tax should be levied on polluting rubber processing firms. A two-step approach was taken to calculate

the most effective level of taxation. First the marginal abatement costs (MAC) of reducing pollution were assessed. The MAC is the amount of money a company must spend to eliminate an 'additional unit' of pollution. It varies depending on the level of pollution being produced by a processing plant. In general, the more a plant cleans up its performance, the more expensive it becomes to make further improvements.

Once the research team compiled a complete picture of how marginal abatement costs and pollution levels are related, they were able to estimate the tax that should be imposed. This was calculated by assessing the MAC of bringing pollution in line with environmental standards. As pollution taxes will have to be paid only by firms that exceed environmental discharge standards, taxes were only calculated for these companies.

DATA COLLECTION FOR RUBBER FACTORIES

Rubber is mainly produced on a large scale in these three districts in Sri Lanka, while small rubber growers are scattered all over the country. In all there are 104 rubber factories that are set up to process rubber. However, in recent years, plantation companies have put many of these factories in mothballs as part of a drive to cut costs. These companies prefer 'central processing' and transport all the rubber latex they produce to the largest factory they own. Because of this concentration of production, there are currently only 62 factories in operation.

Information from these factories was collected through interviews, using a pre-tested questionnaire, and from factory records. Cost and other data for the years 2003, 2004 and 2005 was collated. Pollution data (BOD, COD, TSS and Ph levels of effluent and influent) was also obtained from

Summary statistics of the 62 factories studied (2005)

	Unit	Average	Max
Total cost	Million LKR	38	392
Turnover	Million LKR	210	7429
Wastewater volume	Kilolitres	24664	155977
Influent characteristics			
BOD	Mg/l	1471.4	4500
COD	Mg/l	3218	10000
TSS	Mg/l	333.4	860
PH		5.4	7.1
Effluent characteristics			
BOD	Mg/l	1062.5	5100
COD	Mg/l	2010	8800
TSS	Mg/l	242.9	860
PH		5.9	8.1



waste water samples collected in 2006. These were analyzed at the Rubber Research Institute of Sri Lanka. Information on wastewater volumes was also obtained from factories for the period between 2003 and 2005.

The research team encountered some difficulties in estimating abatement costs. This is because in Sri Lanka, abatement costs are simply not available for most rubber factories. In most cases, there is very limited data available on firms' pollution treatment operations. To overcome this data problem, the total variable cost of factory operations was used instead of the total cost of abatement.

POLLUTION LEVELS AND CLEAN-UP COSTS

The study shows that waste generated by rubber factories varies greatly. The annual wastewater volume generated by rubber factories varies from 914 to 155,977 kiloliters. The pollution generated by an average firm was found to be far worse than the level allowed by environmental standards. For instance, an average firm exceeds COD and BOD standards by 2818 mg/l and 1421 mg/l respectively. It is also clear that almost half the factories do not meet the national standards set for BOD, COD and TSS.

As expected, the MAC increases as the concentration of pollution (specifically COD) in effluent falls (see figure). There is a large variation in the estimated MAC amongst all the factories assessed. This indicates that factories are not using efficient or cost-minimizing pollution abatement technologies. This is an expected consequence of Sri Lanka's use of inefficient command and control instruments to combat pollution.

THE BEST TAXATION LEVEL

Based on the MAC 'profile' of the Sri Lankan rubber processing industry, the researchers calculate that the average tax rate that would motivate firms to comply with current environmental standards is LKR 26 per year for every 100 grams of COD in the effluent. Such a tax would amount to 8.6 per cent of the total annual turnover of the rubber industry. It is important to note that the burden of such a tax would not be uniformly distributed across the industry, and could be as high 25 per cent for smaller firms. Another way to think about this tax is in terms of the rate per unit of rubber output. Expressed in such terms, the optimal tax rate calculated by this study would be about LKR 0.05 per kg of output per year.

If such a tax were to be adopted in Sri Lanka, there would be a number of practical issues that would have to be addressed. In particular, there would be a need to carefully monitor effluent levels so that companies could be charged the right amount of tax. Although this represents a big challenge for the CEA, it also represents an opportunity. The current 'command and control' system requires monitoring, but brings with it no revenue. Under a tax system monitoring would be linked to revenue and the CEA would be better motivated to undertake its monitoring duties. Recently the CEA decentralized some of its pollution control



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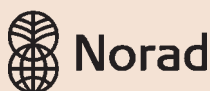
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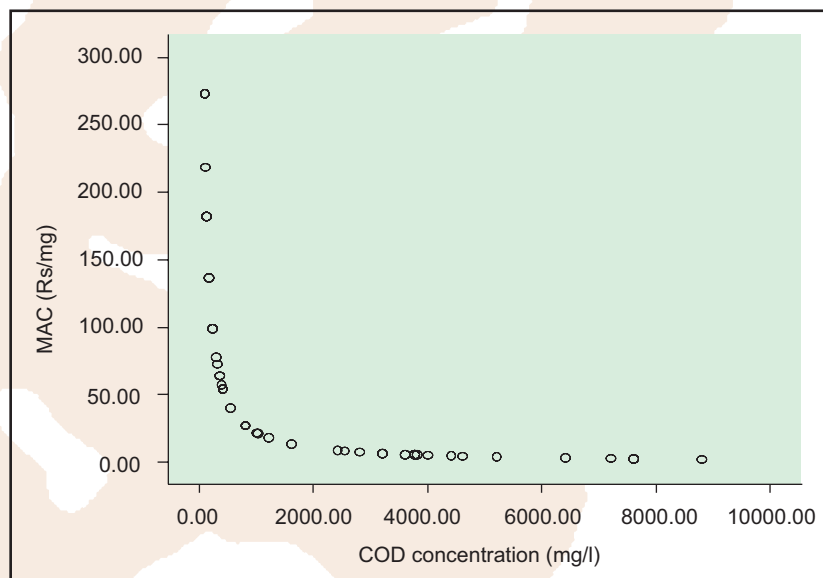
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Estimated marginal cost of abatement curve

activities to reduce its workload and costs. With the necessary legal authority, these newly empowered regional agencies could help implement a tax system to control pollution.

TAXATION BRINGS NEW OPPORTUNITIES AND CHALLENGES

It should be noted that one potential advantage of the tax-based approach is that it may motivate polluting firms to make use of their effluent – so cutting down the amount they have to dispose of. There have been attempts to retrieve important chemicals (such as Qubrachitol) from rubber effluent. Research has also shown that effluent water from the rubber production process can be used as fertilizer for certain crops. Moving towards a tax-based system should increase interest in such alternative 'disposal' options.

Developing a tax for rubber pollution also brings with it some challenges. In particular work needs to be done to see how the legal framework in Sri Lanka can be used to help establish such a tax. In addition, the effect of a pollution tax on rubber exports also needs to be studied. That said, rubber prices are currently high in the world market and producers, who are currently deriving large profits from rubber sales, should be able to bear a tax. However, if a tax is levied, some form of support may be required for smaller firms. This issue requires careful exploration.

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